3.3 AIR QUALITY

This section provides an overview of the six air basins studied for this Program EIR/EIS and describes the composition of air pollutants in and the status of these air basins. In addition, this section describes the potential impacts that may directly and indirectly affect state and regional air quality under the No Project, Modal, and proposed High-Speed Train (HST) Alternatives, using the existing and No Project conditions for comparison.

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Eight air pollutants have been identified by the U.S. Environmental Protection Agency (EPA) as being of concern nationwide: carbon monoxide (CO), sulfur oxides (SO_x), hydrocarbons (HC), oxides of nitrogen (NO_x), ozone (O_3), particulate matter 10 microns in diameter or less (PM10), particulate matter 2.5 microns in diameter or less (PM2.5) and lead (Pb). Except for HC, all of these pollutants (NO_x in the form of NO_2 and SO_x in the form of SO_2) are collectively referred to as criteria pollutants. Pollutants that are considered *greenhouse gases* also affect air quality. Greenhouse gases include, NO_x, HC, and carbon dioxide (CO_2). The sources of these pollutants, their effects on human health and general welfare, and their final deposition in the atmosphere vary considerably.

3.3.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Federal Regulations

Air quality is regulated at the federal level under the Clean Air Act of 1970 (CAA) and the Final Conformity Rule (40 C.F.R. Parts 51 and 93). The Clean Air Act Amendments of 1990 (Public Law [P.L.] 101-549, November 15, 1990) direct the U.S. EPA to implement strong environmental policies and regulations that will ensure cleaner air quality. According to Title I, Section 101, Paragraph F of the Clean Air Act Amendments (42 U.S.C. § 7401 *et seq.*): "No federal agency may approve, accept, or fund any transportation plan, program, or project unless such plan, program or project has been found to conform to any applicable state implementation plan (SIP) in effect under this act." Title 1, Section 101, Paragraph F of the amendments, amends Section 176(c) of the CAA to define *conformity* as follows: conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards; and that such activities will not cause any of the following occurrences.

- Cause or contribute to any new violation of any NAAQS in any area.
- Increase the frequency or severity of any existing violation of any NAAQS in any area.
- Delay timely attainment of any NAAQS or any required interim emissions reductions or other milestones in any area. (42 U.S.C. § 7506[c][1].)

State Regulations

Air quality is regulated at the state level by the California Air Resources Board (CARB), the agency designated to prepare the SIP required by the federal CAA, under the California Clean Air Act of 1988 (Assembly Bill [AB] 2595) and other provisions of the California Health and Safety Code (Health and Safety Code § 39000 *et seq.*). California's Clean Air Act (CCAA) requires all districts designated as nonattainment for any pollutant to "adopt and enforce rules and regulations to achieve and maintain the state and federal ambient air quality standards in all areas affected by emission sources under their jurisdiction."

The responsibility for controlling air pollution in California is shared by 35 local or regional air pollution control and air quality management districts, CARB, and EPA. The districts issue permits for industrial pollutant sources and adopt air quality management plans and rules. CARB establishes the state ambient air quality standards, adopts and enforces emission standards for mobile sources, adopts standards and suggested control measures for toxic air contaminants, provides technical support to the districts, oversees district compliance, approves local air quality plans, and prepares and submits the SIP to EPA. EPA establishes NAAQS, sets emission standards for certain mobile sources (airplanes and locomotives), oversees the state air programs, and reviews and approves the SIP. CARB inventories sources of air pollution in California's air basins and is required to update the inventory triennially, starting in 1998 (Health and Safety Code §§ 39607 and 30607.3). CARB also identifies air basins that are affected by transported air pollution (Health and Safety Code § 39610; 17 C.C.R. Part 70500).

National and State Ambient Air Quality Standards

As required by the CAA Amendments of 1970 (P.L. 91-064, December 31, 1970) and the CAA Amendment of 1977 (P.L. 95-95, August 7, 1977), EPA has established NAAQS for the following air pollutants: CO, O_3, NO_2, PM10, SO_x, and Pb. CARB has also established standards for these pollutants. Recent legislation requires CARB to develop and adopt regulations to reduce greenhouse gases (AB 1493, 2002). The federal and state governments have both adopted health-based standards for pollutants. For some pollutants, the national and state standards are very similar; for other pollutants, the state standards are more stringent. The differences in the standards are generally due to the different health effect studies considered during the standard-setting process and how these studies were interpreted.

Table 3.3-1 lists the federal and state standards. The federal primary standards are intended to protect the public health with an adequate margin of safety. The federal secondary standards are intended to protect the nation's welfare and account for air-pollutant impacts on soil, water, visibility, vegetation, and other aspects of the general welfare. Areas that violate these standards are designated nonattainment areas. Areas that once violated the standards but now meet the standards are classified as maintenance areas. Classification of each area under the federal standards is done by EPA based on state recommendations and after an extensive review of monitored data. Classification under the state standards is done by CARB.

Table 3.3-1
State and National Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]		Federal Standards[b]		
		Concentration[c]	Method[d]	Primary[c,e]	Secondary[c,f,g]	Method[g]
O_3	1 hour	0.09 ppm (180 µg/m^3)	Ultraviolet photometry	0.12 ppm (235 µg/m^3)[h]	Same as primary standard	Ultraviolet photometry
	8 hour	N/A		0.08 ppm (157 µg/m^3)[h]		
PM10	24 hour	50 µg/m^3	Gravimetric or beta attenuation	150 µg/m^3	Same as primary standard	Inertial separation and gravimetric analysis
	Annual arithmetic mean	20 µg/m^3		50 µg/m^3		
PM2.5	24 hour	No separate state standard	Gravimetric or beta attenuation	65 µg/m^3	Same as primary standard	Inertial separation and gravimetric analysis
	Annual arithmetic mean	12 µg/m^3		15 µg/m^3		
CO	8 hour	9.0 ppm (10 mg/m^3)	NDIR	9 ppm (10 mg/m^3)	None	NDIR
	1 hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 hour (Lake Tahoe)	6 ppm (7 mg/m^3)		N/A		
NO_2	Annual arithmetic mean	N/A	Gas phase chemilum-incescence	0.053 ppm (100 µg/m^3)	Same as primary standard	Gas phase chemilum-incescence
	1 hour	0.25 ppm (470 µg/m^3)		N/A		
Pb[i]	30 days average	1.5 µg/m^3	Atomic absorption	N/A	N/A	High volume sampler and atomic absorption
	Calendar quarter	N/A		1.5 µg/m^3	Same as primary standard	
SO_2	Annual arithmetic mean	N/A	Ultraviolet Fluorescence	0.030 ppm (80 µg/m^3)	N/A	Spectro-photometry (Pararosoani-line method)
	24 hour	0.04 ppm (105 µg/m^3)		0.14 ppm (365 µg/m^3)	N/A	
	3 hour	N/A		N/A	0.5 ppm (1300 µg/m^3)	
	1 hour	0.25 ppm (655 µg/m^3)		N/A	N/A	
Visibility reducing particles	8 hour (10 a.m. to 6 p.m., Pacific Standard Time)	In sufficient amount to produce an extinction coefficient of 0.23 per km-visibility of 10 mi (16 km) or more (0.07–30 mi [.011–48 km] or more for Lake Tahoe) due to particles when the relative humidity is less than 70%. Method: Beta attenuation and transmittance through filter tape.		No federal standards		

Pollutant	Averaging Time	California Standards[a] Concentration[c]	Method[d]	Federal Standards[b] Primary[c,e]	Secondary[c,f,g]	Method[g]
Sulfates	24 hour	25 μg/m³				
Hydrogen sulfide	1 hour	0.03 ppm (42 μg/m³)	Ultraviolet fluorescence			
Vinyl Chloride[h]	24 hour	0.01 ppm (26 μg/m³)	Gas chroma-tography			

μg/m³ = micrograms per cubic meter.
mg/m³ = milligrams per cubic meter.
N/A = not available.
NDIR = Non-dispersive infrared photometry.
ppm = parts per million.

[a] California standards for O_3, CO (except Lake Tahoe), SO_2 (1 and 24 hour), NO_2, suspended particulate matter-PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 C.C.R.

[b] National standards (other than O_3, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For PM10, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m3 is equal to or less than one. For PM2.5, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standards.

[c] Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25 °C (77 °F) and a reference pressure of 760 mm (30 in) of mercury. Most measurements of air quality are to be corrected to a reference temperature of 25 °C (77 °F) and reference pressure measurements of air quality are to be corrected to a reference temperature of 25 °C (77 °F) and a reference pressure of 760 mm (30 in) of mercury (1,013.2 millibar [1 atmosphere]); ppm in this table refers to ppm volume, or micromoles of pollutant per mole of gas.

[d] Any equivalent procedure that can be shown to the satisfaction of CARB to give equivalent results at or near the level of the air quality standard may be used.

[e] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[f] Reference method as described by EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by EPA.

[g] New federal 8-hour O_3 and PM2.5 standards were promulgated by EPA on July 18, 1997.

[h] ARB has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

Source: California Air Resources Board 2003.

B. METHOD OF EVALUATION OF IMPACTS

Pollutants

Pollutants that can be traced principally to transportation sources and are thus relevant to the evaluation of the project alternatives include CO, O_3 precursors (NO_x and ROG), PM10, and CO_2. Since high CO levels are mostly the result of congested traffic conditions combined with adverse meteorological conditions, high CO concentrations are generally occur within 300 ft (91 m) to 600 ft (183 m) of heavily traveled roadways. Concentrations of CO on a regional and localized or microscale basis can consequently be predicted appropriately. As discussed above in the affected environment section, TOG and NO_x emissions from mobile sources are of concern primarily because of their role as precursors in the formation of O_3 and particulate matter. O_3 is formed through a series of reactions that occur in the atmosphere in the presence of sunlight over a period of hours. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated O_3 levels are often found many miles from sources of the precursor pollutants. The impacts of TOG and NO_x emissions are therefore generally examined on a regional level. CO_2 emission burdens, because of their global impact, are currently expressed only on the statewide level by CARB and EPA. In this analysis, therefore, CO_2 impacts are discussed on the statewide level. It is appropriate to predict concentrations of PM10 on a regional and localized basis. EPA is currently developing a standardized methodology to evaluate PM10 on a local level.

Pollutant Burdens

The air quality analysis for this Program EIR/EIS focuses on the potential statewide, regional, and localized impacts on air quality. The regional pollutant burdens were estimated based on changes that would occur, including the following, under each of the alternatives.

- Highway vehicle miles traveled (VMT).
- Number of plane operations.
- Number of train movements (proposed HST and existing LOSSAN system).
- Power requirements for the proposed HST system.

Localized air quality impacts were estimated near proposed station locations and airports potentially affected by the Modal and HST Alternatives. The potential impacts of these alternatives were compared to existing conditions and the No Project Alternative.

A comparison of the 2003 conditions to the 2020 No Project conditions illustrates the expected trends in air quality. The potential impacts from proposed alternatives were then added to the 2020 conditions. Changes in VMT for on-road mobile sources (vehicles) and for off-road mobile sources (number of plane operations and train movements) were estimated for each of the alternatives. Changes in emissions of stationary sources (electrical power generators) were also assessed.

Highway VMT: On-road pollutant burdens were calculated as a ratio of baseline VMT to estimated VMT changes under each alternative. Although vehicular speeds affect emission rates, the potential basin-wide speed changes were considered too small to affect overall emission estimates; thus changes in future on-road mobile source emission burdens for the project were based solely on VMT changes and did not consider speed.

Number of Plane Operations: The Federal Aviation Administration's (FAA's) Emission and Dispersion Modeling System (EDMS) is used to estimate airplane emissions. The EDMS model estimates the emissions generated from a specified number of landing and take-off (LTO) cycles. Along with the emissions from the planes themselves, emissions generated from associated ground maintenance requirements are also included. Average plane emissions are calculated based on a typical 737 aircraft. The pollutant burdens generated by the LTOs under each alternative were added to CARB's off-road mobile sources (planes) emission budgets for each air basin to determine the potential impacts of the alternatives.

Number of Train Movements: Ridership projections for the HST system varied between 42 million and 68 million passengers (including 10 million long-distance commuters) for 2020, with potential for significantly higher ridership beyond 2020 (Charles River Associates 1996). The figures on the lower end of these estimates are considered *investment-grade forecasts,* which were used in the California High Speed Rail Authority's (Authority's) final business plan (Business Plan) and are based conservatively on current costs, travel times, and congestion levels of air and automobile transportation. The figures on the higher end are based on a *sensitivity analysis*, which assumes the increased costs and congestion associated with air and automobile travel would result in greater potential ridership for the intercity HST system. The sensitivity analysis started with the investment-grade ridership forecasts and applied variations in mode characteristics that tend to increase HST ridership and revenue to determine how sensitive HST ridership is to travel times, fares, etc. This sensitivity analysis produced a higher ridership forecast, which is used in this Program EIR/EIS to define a maximum impact potential of the Modal and HST Alternatives.

For this report and the overall Program EIR/EIS process, the higher demand forecast of 68 million riders (58 million intercity trips and 10 million commute trips), based on the sensitivity analysis, offers a more reasonable scenario to represent total capacity, while serving as a representative worst-case scenario for defining the physical and operational aspects of the alternatives in 2020. This higher forecast is generally used as a basis for defining the Modal and HST Alternatives and is referred to in this report as the *representative demand*. In some specific analyses such as this air quality analysis, the high-end forecasts result in a benefit because of additional VMT being removed from the road and a decrease in LTO cycles for planes. In those cases, additional analysis is included in this Program EIS/EIR also to address the impacts associated with the low-end (investment-grade) forecasts.

To determine the number of plane trips potentially replaced from the No Project scenario daily by the HST Alternative, the following calculations were performed using sensitivity ridership variation projections as defined above. The number of annual air trips that could be removed by the proposed HST system (25.3 million) was divided by an average number of passengers per flight (101.25). The resulting number of flights per year (250,551) was then divided by the number of days per year to reach the number of flights per day (771) that could potentially be removed by the proposed HST system. (See Chapter 2 *Alternatives*, for definition of system alternatives.)

25.3 million trips = 25.3 million flying passengers (1 trip = 1 takeoff and 1 landing)

1 flight = 101.25 passengers (135 seats X 75% load factor, as per Table 3.2-3 in the *System Definition Report*)

Therefore,

250,551 flights/year = (25,368,285 passengers/year) / (101.25 passengers/flight)

771 flights/day = 250,551 flights/year X 1 year / 325 days

Similar calculations were prepared for the proposed HST Alternative based on the investment-grade ridership forecasts.

Additional train emissions from potentially increased feeder service to the proposed HST service were also assessed based on predicted ridership forecasts.

<u>Power Requirements</u>: In addition to the on-road and off-road emission burdens, emissions resulting from the power generated to run the HST system were estimated and included in the emission burden of the HST Alternative. Emission estimates are based on British thermal unit (BTU) requirements calculated in the energy analysis for the project (see Section 3.5). BTU emission factors are based on information from *Conserving Energy and Preserving the Environment: The Role of Public Transportation* (Shapiro et al. 2002), and the *Transportation Energy Data Book* (U.S. Department of Energy 2002).

Pollutant burdens generated by on-road (vehicles), off-road (planes, trains), and stationary (electric power generation) sources were combined and compared to the No Project Alternative and to each other, i.e. among the Modal and HST Alternatives. Because of the nature of electrical power generation and the use of a grid system to distribute electrical power, it is not yet clear which facilities would be supplying power to the proposed HST system. Emission changes from power generation can therefore be predicted on a statewide level only.

C. RATING SCHEME

The relevance of the potential emission changes was assessed from a total pollutant burden and percentage change compared to the No Project Alternative in the affected air basins and statewide. Depending on each air basin's attainment status, the predicted differences were ranked as a high (+ or -), medium (+ or -), or low (+ or -) impact. The ranking of high, medium, or low is based on the potential magnitude of the emission changes compared to the No Project emission inventory (on-road sources, planes, and trains) and the general conformity threshold levels for nonattainment and maintenance areas. The emission inventory is CARB's estimate of the amount of pollutants emitted into the atmosphere from major mobile, stationary, area-wide, and natural source categories over a specific period of time such as a day or a year. For this analysis the projected emission inventory for 2020 was used. The general conformity threshold is a level where a conformity determination is required if the project is predicted to equal or exceed specific burdens. A plus (+) impact would indicate a potential benefit to an air basin for a specific pollutant. A minus (-) impact would indicate a potential deterioration to a basin for a specific pollutant. For example, a high (+) impact would represent a considerable improvement (lower emissions) in emissions, and a low (-) impact would represent a slight deterioration (higher emissions) in emissions. A percent difference indicates the extent of potential impact on the air basin's projected emission budget.

A regionally significant project for conformity purposes, as defined in Title 40 (i.e., 40 C.F.R. §51.852) is one that would produce direct and indirect potential impacts that represent 10% or more of a nonattainment or maintenance area's emission inventory for the pollutant. Any alternative that results in this level of impact was given a high (+) or (-) ranking.

Conformity determinations are required for all projects receiving federal funding. For projects where the total direct and indirect emissions would be below the amounts listed in Table 3.3-2, conformity is assumed. Any proposed alternative that results in this level of impact is given a low (+) or (-) ranking. Proposed alternatives that would potentially result in pollutant burdens between the low and high category are classified as medium. A net CO_2 analysis for each alternative that accounts for reductions/increases in vehicle fuel use, as well as changes in electricity production, is used in the conformity analysis.

Table 3.3-2
Pollutant Burden Rates Requiring a Conformity Determination

Pollutant	Area's Attainment Status	Tons (Metric Tons)/Year
O_3 (VOCs or NO_x)	Nonattainment—serious	50 (45)
	Nonattainment—severe	25 (23)
	Nonattainment—extreme	20 (18)
	Nonattainment—outside an ozone transport region	100 (91)
	Nonattainment—moderate/marginal inside an ozone transport region	50/100 (45/91) (VOC/NO_x)
	NO_x maintenance	100 (91)
	VOC maintenance—outside ozone transport region	100 (91)
	VOC maintenance—inside ozone transport region	50 (45)

Pollutant	Area's Attainment Status	Tons (Metric Tons)/Year
CO	Nonattainment—all	100 (91)
	Maintenance	100 (91)
PM10	Nonattainment—moderate	100 (91)
	Nonattainment—serious	70 (64)
	Maintenance	100 (91)

VOC = volatile organic compound.

Source: Code of Federal Regulations, Title 40, Part 51, Subpart W.

D. LOCALIZED AIR QUALITY IMPACTS

To quantify a project's impact on local pollutant levels, a screening analysis was conducted based on overall traffic volumes and projected changes in volume-to-capacity (V/C) ratios and level of service estimates. Per state and national guidelines (California Department of Transportation 1997), baseline intersection level of service estimates of D or below that would degrade because of a project have the potential to affect local air quality. Similarly, volume increases of greater than 5% could potentially impact local air quality levels. The traffic analyses determined which roadways would experience an impact (positive or negative) under the project alternatives.

For this level of analysis, however, detailed intersection information has not been generated. Rather, traffic screenlines have been developed. *Screenlines* describe defined segments of a roadway that were selected to reasonably represent the routes affected by the proposed alternatives, as discussed in detail in Section 3.1, *Traffic and Circulation*. The estimated traffic volume generated or reduced by the Modal and HST Alternatives was added to No Project traffic volumes and expressed as overall screenline volumes (typical values based on averages over time), level of service, and V/C ratios. These factors were compared to No Project values, and locations with potentially high impacts were identified. The screenlines do not include an analysis of intersections and are therefore not detailed enough to be used for an air quality intersection screening analysis. However, the screenline numbers provide a general idea of the project's impact on the roadway network. Based on these numbers, general potential impacts on the local roadway network for each of the alternatives are discussed below.

3.3.2 Affected Environment

A. STUDY AREA DEFINED

California is divided into 15 air basins (17 C.C.R. § 60100 *et seq.*). Each has unique terrain, meteorology, and emission sources. This analysis has been structured to estimate the potential impacts on the six air basins directly affected by the proposed alternatives, as illustrated in Figure 3.3-1. The following basins are considered in this study.

- Sacramento Valley.
- San Francisco Bay Area.
- San Joaquin Valley.
- Mojave Desert.
- South Coast.
- San Diego County.

Air quality in nearby air basins could also be affected by changes in travel patterns, miles traveled, and regional pollutant transport resulting from the proposed alternatives. These effects are expected to be less than those experienced by the basins that physically contain the project. For this program-level analysis, potential impacts on air quality are described only for the air basins that physically contain the proposed alternatives. Nearby air basins are not discussed in this program-level analysis. Once the alternatives are refined and more detailed analyses are conducted, nearby basins should be studied.

B. GENERAL DISCUSSION OF AIR QUALITY RESOURCES

Each pollutant is briefly described below.

- Carbon monoxide (CO) is a colorless, odorless gas that is generated in the urban environment primarily by the incomplete combustion of fossil fuels in motor vehicles. Relatively high concentrations of CO can be found near crowded intersections and along heavily used roadways carrying slow-moving traffic. CO chemically combines with the hemoglobin in red blood cells to decrease the oxygen-carrying capacity of the blood. Prolonged exposure can cause headaches, drowsiness, or loss of equilibrium.
- Sulfur oxides (SO_x) constitute a class of compounds of which sulfur dioxide (SO_2) and sulfur trioxide (SO_3) are of great importance in air quality. SO_x is also generated by the incomplete combustion of fossil fuels in motor vehicles. However, relatively little SO_x is emitted from motor vehicles. The health effects of SO_x include respiratory illness, damage to the respiratory tract, and bronchio-constriction.
- Hydrocarbons (HC) comprise a wide variety of organic compounds, including methane (CH_4), emitted principally from the storage, handling, and combustion of fossil fuels. Hydrocarbons are classified according to their level of photochemical reactivity: relatively reactive or relatively non-reactive. Non-reactive hydrocarbons consist mostly of methane. Emissions of total organic gases (TOG) and reactive organic gases (ROG) are two classes of hydrocarbons measured for California's emission inventory. TOG includes all hydrocarbons, both reactive and non-reactive. In contrast, ROG includes only the reactive HC. TOG is measured because non-reactive HC have enough reactivity to play an important role in photochemistry. Though HC can cause eye irritation and breathing difficulty, their principal health effects are related to their role in the formation of ozone. HC is also considered a greenhouse gas.
- Nitrogen oxides (NO_x) constitute a class of compounds that include nitrogen dioxide (NO_2) and nitric oxide (NO), both of which are emitted by motor vehicles. Although NO_2 and NO can irritate the eyes and nose and impair the respiratory system, NO_x, like HC, is of concern primarily because of its role in the formation of ozone. Nitrogen oxide is also considered a greenhouse gas.
- Ozone (O_3) is a photochemical oxidant that is a major cause of lung and eye irritation in urban environments. It is formed through a series of reactions involving HC and NO_x that take place in the atmosphere in the presence of sunlight. Relatively high concentrations of O_3 are normally found only in the summer because low wind speeds or stagnant air coupled with warm temperatures and cloudless skies provide the optimum conditions for O_3 formation. Because of the long reaction time involved, peak ozone concentrations often occur far downwind of the precursor emissions. Thus, ozone is considered a regional pollutant rather than a localized pollutant.
- Particulate matter includes both airborne and deposited particles of a wide range of size and composition. Of particular concern for air quality are particles smaller than or equal to 10 microns and 2.5 microns in size, PM10 and PM2.5, respectively. The data collected through many nationwide studies indicate that most PM10 is the product of fugitive dust, wind erosion, and agricultural and forestry sources, while a small portion is produced by fuel combustion

processes. However, combustion of fossil fuels account for a significant portion of PM2.5. Airborne particulate matter mainly affects the respiratory system.

- Lead (Pb) is a stable chemical element that persists and accumulates both in the environment and in humans and animals. There are many sources of lead pollution, including mobile sources such as motor vehicles and other gasoline-powered engines, and non-mobile sources such as petroleum refineries. Lead levels in the urban environment from mobile sources have significantly decreased due to the federally mandated switch to lead-free gasoline. The principal effects of lead on humans are on the blood-forming, nervous, and renal systems.
- Carbon dioxide (CO_2) is a colorless, odorless gas that occurs naturally in the earth's atmosphere. Significant quantities are also emitted into the air by fossil fuel combustion. CO_2 is considered a greenhouse gas. The natural *greenhouse effect* allows the earth to remain warm and sustain life. Greenhouse gases trap the sun's heat in the atmosphere and help determine our climate. As atmospheric concentrations of greenhouse gases rise, so may temperatures. Higher temperatures may result in more emissions, increased smog, and respiratory disease.

The existing (Year 2001) baseline pollutant burden for each of the six air basins is described in the following section. The existing baseline represents the current air quality conditions in each of the air basins in the study area. The future No Project conditions are considered the estimated 2020 future baseline pollutant burden for each of the affected air basins. The existing and future baseline information was developed using the CARB pollutant burden projections for the years 2001 and 2020 available at the CARB Web site, with the year 2020 corresponding to the comparison year for the system alternatives. CARB projections are based on future growth levels in stationary, area-wide, and mobile sources. CARB projections account for emission reductions resulting from clean vehicles and clean fuel programs. There are two categories of mobile sources: on road and off road. Vehicles licensed for highway use are considered on-road mobile sources; airplanes, marine vessels, locomotives, construction and garden equipment, and recreational off-road vehicles are considered off-road mobile sources.

C. AIR RESOURCES BY AIR BASIN

The air quality attainment status based on state and federal standards for CO, particulate matter, and O_3 for each of the air basins in the study area is shown in Table 3.3-3. All air basins are assigned an *attainment status* for air pollutants based on meeting state and federal pollutant standards. There are some differences between state and federal standards, so a pollutant might not have the same status under each standard. A basin is considered in *attainment* for a particular pollutant if it meets the standards set for that pollutant. A basin is considered in *maintenance* for a pollutant if the standards were once violated but are now met. And a basin is considered *nonattainment* for a particular pollutant if its air quality exceeds standards for that pollutant. A basin is considered unclassified if the area cannot be classified on the basis of available information as meeting or not meeting the applicable standard. The standards and status designations are discussed in more detail above in Section 3.3.1, *Regulatory Requirements and Methods of Evaluation*.

Table 3.3-3
Attainment Status of Affected Air Basins

	Pollutant					
	CO		PM10		O_3	
Air Basin	National Standard	State Standard	National Standard	State Standard	National Standard	State Standard
Sacramento Valley	Maintenance	Unclassified/ attainment	Portions unclassified/ portions nonattainment	Nonattainment	Portions unclassified-attainment/ portions nonattainment	Nonattainment/ portions nonattainment-transitional
San Francisco Bay Area	Maintenance	Attainment	Unclassified	Nonattainment	Nonattainment	Nonattainment
San Joaquin Valley	Maintenance	Unclassified/ attainment	Nonattainment	Nonattainment	Nonattainment	Nonattainment
Mojave Desert	Unclassified/ attainment	Unclassified/ attainment	Nonattainment	Nonattainment	Portions unclassified-attainment/ portions nonattainment	Nonattainment
South Coast	Nonattainment	Non-attainment/ transitional	Nonattainment	Nonattainment	Nonattainment	Nonattainment
San Diego County	Maintenance	Attainment	Unclassified	Nonattainment	Nonattainment	Nonattainment
Source: California Air Resources Board 2002.						

San Francisco Bay Area Air Basin

The San Francisco Bay Area Air Basin covers California's second largest metropolitan area. The counties in the air basin include Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara, as well as the southern half of Sonoma County and the southwestern portion of Solano County. The unifying feature of the basin is the San Francisco Bay, which is oriented north-south and covers about 400 square miles (sq mi) (1,036 square kilometers [sq km]) of the area's total 5,545 sq mi (14,361 sq km). Approximately 20% of California's population resides in this air basin. The area is surrounded by hills, but low passes and the Sacramento–San Joaquin River Delta, which extends to the San Francisco Bay, allow some air pollutant transport to the Central Valley.

Pollution sources in the basin account for about 16% of the total statewide criteria pollutant emissions. The basin is classified as a nonattainment area for O_3 (state and federal standards). For CO, the basin is considered unclassified and/or attainment. For PM10, the basin is classified as a nonattainment area for the state standard and as an unclassified area for the national standard.

Emissions of O_3 precursors (NO_x and ROG) have decreased since 1975 and are projected to continue declining through 2010. This is the result of strict motor vehicle controls that have reduced emissions from mobile sources of these pollutants. Stationary source emissions of ROG have declined over the last 20 years because of new controls on oil refinery fugitive emissions and new rules for control of ROG from various industrial coatings and solvent operations.

PM10 emissions are predicted to increase through 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust sources. Mobile source emissions from diesel motor vehicles have been decreasing since 1990 even though population and VMT have been growing. This is due to stringent emission standards.

CO emissions have been declining in the basin over the last 25 years, and this trend is expected to continue. Motor vehicles and other mobile sources are the largest sources of CO emissions in the air basin. Due to stringent controls measures, CO emissions from motor vehicles have been declining.

Sacramento Valley Air Basin

The Sacramento Valley Air Basin encompasses the northern portion of the Central Valley. The air basin includes the counties of Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba, along with the western urbanized portion of Placer County and the eastern portion of Solano County. The basin covers more than 15,000 sq mi (38,850 sq km) and accounts for approximately 6% of the state's population. It is the fifth-most-populated air basin in California.

The basin is classified as a state nonattainment area for O_3 (1-hour standard). The Sacramento region (Butte, Yuba, Sutter, Placer, Sacramento, Solano, and Yolo Counties) is classified as a national nonattainment area for Ozone (1-hour standard). The Sacramento region and Shasta and Tehama Counties have been recommended to be designated nonattainment areas for the national 8-hour O_3 standard.

The Sacramento Valley Air Basin is classified as a nonattainment area for the state PM10 standard and is an unclassified area for the national PM10 standard. The basin is classified as either unclassified or attainment for both the state and national CO standards.

Population in the air basin grew between 1981 and 2000 by 51%, a rate higher than the 39% increase statewide. VMT increased by 95%, slightly higher than the 91% increase statewide. However, emissions of the O_3 precursors, NO_x and ROG, have decreased since 1990 and are projected to continue declining through 2010 because of more stringent mobile source emission standards and cleaner-burning fuels. ROG emissions have also declined because of new rules controlling various industrial coating and solvent operations.

While emission levels of O_3 precursors are decreasing, peak O_3 values in the Sacramento Valley Air Basin have not declined as quickly as in other urban areas. Additional emission controls will be needed to bring the area into attainment for the state and national ozone standards.

Direct emissions of PM10 are increasing in the basin. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads, construction and demolition, and residential fuel combustion. These area-wide emission sources have increased because of population growth and increased VMT.

CO emissions are declining in the basin. With new stringent emission standards, CO emissions from motor vehicles have declined. Stationary and area-wide source CO emissions have remained relatively steady, with additional emission controls offsetting growth. These controls will help keep the area in attainment for both the state and national CO standards.

San Joaquin Valley Air Basin

The San Joaquin Valley Air Basin encompasses the southern two-thirds of California's Central Valley. The counties in this basin include Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare, and the western portion of Kern. The basin spreads across 25,000 sq mi (64,750 sq km). The basin is mostly flat and unbroken with most of the area below 400 ft (122 m) elevation. The San Joaquin River runs along the western side of the basin from south to north. The San Joaquin Valley has cool wet winters and hot dry summers. Generally the temperature increases and rainfall decreases from north to south.

The basin is classified as a state and national nonattainment area for PM10. It is classified as an attainment and/or unclassified area for CO. The area is classified as a state and national nonattainment area for O_3. The ozone problem in the air basin ranks among the most severe in California.

Air quality is not dominated by emissions from one large urban area in this basin. Instead, there are a number of moderately sized urban areas spread along the main axis of the valley. Approximately 9% of the state's population lives in the San Joaquin Valley. Pollution sources in the region account for about 14% of the total statewide criteria pollutant emissions.

The population in the San Joaquin Valley Air Basin increased by 56% from 1981 to 2000. This is a much higher rate than the statewide average of 39%. During the same time period, the daily VMT increased by 136%, again much higher than the overall statewide average of 91%. Overall, except for PM10, the emission levels in the San Joaquin Valley Air Basin have been decreasing since 1990. The rate of improvement, however, has not been the same as for other air basins. This is due mainly to the large growth rates this area has experienced.

Emissions of the O_3 precursors, NO_x and ROG, are decreasing in the air basin. NO_x emissions have decreased by approximately 24% since 1985, and are predicted to decrease another 26% by 2010. ROG emissions have decreased by approximately 48% since 1985. They are predicted to decrease another 11% by 2010. These reductions have resulted from more stringent mobile and stationary source emission controls and standards. The basin has shown less improvement than other areas due in large part to the growth rates in population and VMT.

Direct emissions of PM10 have been increasing in the air basin and are expected to continue increasing. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, waste burning, and residential fuel combustion. These increases are a direct result of the large growth in population and VMT. Mobile sources (emissions directly emitted from motor vehicles) are predicted to decrease through 2010 because of new diesel standards.

CO emissions have been trending downward since 1985 and are expect to continue downward through 2010. Motor vehicles are the largest source of CO emissions in the air basin. Emissions from motor vehicles have been declining since 1985, despite increased VMT. This is due to stringent emission control measures and standards.

Mojave Desert Air Basin

The Mojave Desert Air Basin is located in the southeastern section of California. It is bordered on the south by the Salton Sea Air Basin, on the west by the South Coast and the San Joaquin Valley Air Basins, on the north by the Great Basin Valleys Air Basin, and on the east by the states of Nevada and Arizona. It encompasses the high desert region of San Bernardino County and the desert portions of Kern and Los Angeles Counties. With an area in excess of 25,950 sq mi (67,210 sq km), it is the second largest of California's air basins and accommodates approximately 2.5% of the state population. Air quality is dominated by emissions from urban areas in the western portions of the basin and from transported emissions from the large urban areas to the south and west. Despite a downward trend in O_3 levels since 1995, the basin is classified as both state and national nonattainment area for O_3 (1-hour standard).

Communities such as Hesperia and Phelan, which are in close proximity to the Cajon Pass, historically experience the highest O_3 levels in the basin. This is due to pollutants funneled into the high desert through the pass from Los Angeles and the San Bernardino Valley. These pollutants are dispersed as they are blown inland. Locally generated O_3 precursor emissions of NO_x and ROG also contribute to the high O_3 levels that affect the basin. Emission controls, mainly for exhaust emissions, have resulted in reductions in NO_x, ROG, and CO levels. Emissions of the O_3 precursors NO_x and ROG have been trending downward since 1990.

CO emissions are on a downward trend. The portions of the basin in Kern and Riverside Counties are designated as a state attainment area for CO. The portions of Los Angeles and San Bernardino Counties in the air basin are designated as a state attainment area. The entire basin is designated as a national unclassified/attainment area for CO.

PM10 emissions in the basin continue to rise as the volume of vehicles on unpaved roads and off road increases. The basin is designated as a state nonattainment area for PM10. Kern, Los Angeles, and Riverside Counties are unclassified, while the remainder of the basin is designated as nonattainment for the national air quality standards.

South Coast Air Basin

The South Coast Air Basin encompasses 6,729 sq mi (17,428 sq km). It includes California's largest metropolitan region: all of Orange County, the western highly urbanized portions of San Bernardino and Riverside Counties, and the southern two-thirds of Los Angeles County. It accommodates a population of 14.9 million, or more than 40% of California's population, and is the most populous air basin in the state. About 30% of the state's total criteria pollutant emissions are generated in the basin. The basin is generally a lowland plain bounded by the Pacific Ocean on the west and by mountains on the other three sides.

The population in the South Coast Air Basin grew at high rates from 1981 to 2000, increasing 34% from 11.1 million in 1981 to 14.9 in 2000. Daily VMT increased about 84% during that same period. While high growth rates are generally associated with increased emissions, the implemented control programs in the basin have resulted in emission decreases.

The warm weather associated with predominantly high-pressure systems in the basin is conducive to the formation of O_3. The surrounding mountains help cause frequent low inversion heights and stagnant air conditions. These factors combine to trap pollutants in the air basin, and resulting concentrations are among the highest in the state. Aggressive emission controls have resulted in a downward trend in O_3 levels. The basin is classified as both a state and national nonattainment area for O_3 (1-hour standard).

NO_x emissions in the basin fell by about 38% from 1985 to 2000 and are forecasted to continue that trend to 2010. ROG emissions remained relatively flat from 1975 to 1985. Between 1985 and 2000 they decreased by approximately 60%. ROG emissions are predicted to decrease another 40% by 2010.

Emissions of CO in the South Coast Air Basin have been trending downward since 1975, even though VMT has increased and industry activity has grown. Los Angeles County is designated as nonattainment for the state ambient air quality standards, while the remainder of the air basin is designated as attainment. The basin is designated as nonattainment for CO for the national ambient air quality standards.

Direct emissions of PM10 have increased in the South Coast Air Basin since 1975. The increase is attributed to emissions from area-wide sources such as fugitive dust from paved and unpaved roads. Growth in activity of the area-wide sources reflects the increased population growth and VMT in the basin. PM10 continues to be a problem in the South Coast Air Basin, which is designated as nonattainment for both the state and national ambient air quality standards. More controls specific to PM10 will be needed to reach attainment.

San Diego Air Basin

The San Diego Air Basin is located in the southwestern corner of California and comprises all of San Diego County. It is bounded on the south by Mexico, on the west by the Pacific Ocean, on the north by Orange and Riverside Counties, and on the east by Imperial County. Its 4,260-sq-mi (11,033-sq-km) area accommodates a population of 2.9 million, or 8% of the state's population, and produces about 7% of the state's criteria pollutant emissions.

In the last 20 years, the San Diego Air Basin has experienced one of the highest population growth rates of the state's urban areas. Population grew from more than 1.9 million in 1981 to 2.9 million in 2000. VMT more than doubled during that same period from 35 million to approximately 74 million mi (56 million to 119 million km). Despite this growth trend, the overall air quality of the basin has improved, reflecting the benefits of cleaner technology.

Much of the San Diego Air Basin has a relatively mild climate due to its southern location and proximity to the ocean. The majority of the population is concentrated in the western portion of the basin, and the emissions are concentrated there. The basin is impacted by locally produced emissions as well as pollutants transported from other areas. O_3 and O_3 precursor emissions are transported from the South Coast Air Basin and Mexico. Implemented controls have resulted in a downward trend in O_3 levels and reductions in emissions from its precursors NO_x and ROG in the basin. However, O_3 levels continue to pose problems because exceedances of the state and national ambient air quality standards persist.

CO concentrations in the San Diego Air Basin decreased approximately 56% from 1981 to 2000. As a result, the national CO standards have not been exceeded since 1989, and the state standard has not been exceeded since 1990. The basin will likely maintain its attainment status for both national and state standards by continuing the enforcement of the stringent motor vehicle regulations currently in place.

Direct emissions of PM10 in the San Diego Air Basin increased 69% from 1975 to 2000, and the forecast is for a continued increase at a rate of approximately 7% to 2010. Growth in area-wide source emissions, mainly fugitive dust from vehicles on paved and unpaved roads, dust from construction and demolition operations, and particulates from residential fuel combustion are mainly responsible for this increase. The growth in these area-wide sources primarily derives from the increase in population and VMT in the basin. The San Diego Air Basin is designated as nonattainment for the state ambient air quality standard and is unclassified for the national standard.

3.3.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

Pollutant burden levels of CO, NO_x, and TOG are predicted to decrease statewide through 2020 compared to 2001 levels (Figure 3.3-2). This decrease is due to the implementation of stringent standards, control measures, and state-of-the-art emission control technologies. Emissions per vehicle are dropping significantly in California as a result of CARB's clean vehicle and clean fuel programs. Consequently, motor vehicle emissions are declining overall despite an increase in VMT. The low emission vehicle (LEV) and LEVII regulations adopted in 1990 and 1998, respectively, require a declining average fleet emission rate for new cars, pickup trucks, and medium-duty vehicles (including sport utility vehicles). These regulations, which are being implemented between 1994 and 2010, are expected to result in about a 90% decline in new vehicle emissions. Similar emission reductions are occurring in the heavy-duty diesel truck fleet as progressively lower emission standards for new trucks are introduced. The next phase of tighter diesel truck standards, scheduled to be implemented between 2007 and 2010, is expected to produce an overall reduction of 98% from uncontrolled engine emissions.

According to CARB pollutant burden projections, emissions of PM10 are expected to increase statewide for the No Project Alternative compared to existing conditions. The upward trend in PM10 emissions is primarily due to increased emissions from area-wide sources, including dust from increased VMT on unpaved and paved roads. PM10 emissions from stationary sources are also expected to increase slightly in the future because of industrial growth.

CO_2 levels for 2001 are not currently available. In the November 2002 report "Inventory of California Greenhouse Gas Emissions and Sinks: 1990–1999," by the California Energy Commission, 1999 CO_2 emissions are estimated at 362.8 million metric tons. This estimate is not broken down by source type; therefore a direct comparison to No Project, which includes only on-road mobile, planes, trains, and electric power sources, cannot be made.

The percentage of each pollutant source that may be affected by the proposed alternatives is shown in Figure 3.3-3. Of the four sources of concern shown in the figure, on-road mobile is the largest single contributor for all the pollutants. For CO, on-road mobile sources would contribute 32% of the statewide total; for NO_x on-road mobile sources would contribute 24% of the statewide total. By detailing the potential overall contribution to statewide pollution levels of each of these sources, the relationship between changes in sources and overall pollution concentrations becomes clearer.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH–SPEED TRAIN ALTERNATIVES

No Project Alternative Compared to Modal Alternative (Sensitivity Analysis Variations in Ridership Forecast)

Roadways: The highway component of the Modal Alternative would add approximately 2,970 lane mi (4,780 km) to the highway system. According to the analysis in Chapter 5 addressing economic growth effects, the added lanes of the Modal Alternative would result in approximately 1.1% more VMT in 2020 than the No Project Alternative in 2020. Therefore, the Modal Alternative is predicted to increase the amount of on-road mobile source regional pollutants by 1.1% compared to No Project (Table 3.3-4).

Air Travel: The same number of air trips would occur under both the No Project and Modal Alternatives. In the No Project Alternative these trips would be handled in an inefficient manner (i.e., more flights leaving at off-peak times). In the Modal Alternative these flights would be handled in a more efficient manner. Airport gates would need to be added, however, to efficiently handle the forecasted future demand (representative demand). The air travel component of the Modal Alternative is based on an estimated additional 91 airport gates required statewide to efficiently service the 34 million trips (68 million boarding/departing passengers) as defined for the Modal Alternative in Chapter 2. The additional gates would handle the trips projected for year 2020 more efficiently than No Project. Since additional gates would be built under the Modal Alternative to serve demand already projected under No Project, the Modal Alternative would generate no more LTOs than the No Project Alternative; therefore, no more airplane pollutant burdens would be generated as compared to the No Project Alternative. No Project and Modal Alternative plane emission burdens are shown in Table 3.3-5.

Train Travel and Electrical Power: Conventional rail service is not predicted to increase nor is additional electrical power predicted to be required under the Modal Alternative. Thus, the Modal Alternative would generate no more train or electrical power stationary pollutant burdens than No Project.

Table 3.3-4
On-Road Mobile Source Regional Analysis—No Project and Modal Alternatives

Air Basin	No Project VMT (Km) (2020) (in millions)	Modal VMT (Km) (2020) (in millions)	No Project Emission Burden in Tons (Metric Tons)/Day				Modal Alternative Emission Burden in Tons (Metric Tons)/Day				Incremental Change from No Project in Tons (Metric Tons)/Day and % Change from No Project			
			CO	PM10	NO_x	TOG	CO	PM10	NO_x	TOG	CO	PM10	NO_x	TOG
Sacramento Valley	84.079 (135.312)	85.004 (136.801)	203.67 (184.77)	4.63 (4.20)	31.57 (28.64)	28.33 (25.70)	205.9 (186.8)	4.7 (4.3)	31.9 (28.9)	28.6 (25.9)	2.2 (2.0)/ 1.1%	0.1 (0.1)/ 1.1	0.4 (0.4)/ 1.1%	0.3 (0.3)/ 1.1
San Francisco Bay Area	213.901 (344.240)	216.253 (348.025)	493.23 (447.45)	10.46 (9.49)	89.55 (81.24)	68.17 (61.84)	498.7 (452.4)	10.6 (9.6)	90.5 (82.1)	68.9 (62.5)	5.4 (4.9)/ 1.1%	0.1 (0.1)/ 1.1%	1.0 (0.9)/ 1.1%	0.8 (0.7)/ 1.1%
San Joaquin	135.617 (218.254)	137.109 (220.656)	336.18 (304.98)	9.30 (8.44)	61.59 (55.87)	41.01 (37.20)	339.9 (308.4)	9.4 (8.5)	62.3 (56.5)	41.5 (37.6)	3.7 (3.4)/ 1.1%	0.1 (0.1)/ 1.1%	0.7 (0.6)/ 1.1%	0.5 (0.5)/ 1.1%
Mojave Desert	44.681 (71.907)	45.172 (72.697)	93.55 (84.87)	2.39 (2.17)	12.75 (11.57)	5.49 (4.98)	94.6 (85.8)	2.4 (2.2)	12.9 (11.7)	5.6 (5.1)	1.0 (0.9)/ 1.1	0.03 (0.03)/ 1.1%	0.1 (0.1)/ 1.1%	0.1 (0.1)/ 1.1%
South Coast	402.116 (647.143)	406.539 (654.261)	1,007.32 (913.83)	24.65 (22.36)	150.30 (136.35)	133.50 (121.10)	1,018.4 (923.9)	24.9 (22.6)	152.0 (137.9)	135.0 (122.5)	11.1 (10.1)/ 1.1%	0.3 (0.03)/ 1.1%	1.7 (1.5)/ 1.1%	1.5 (1.4)/ 1.1%
San Diego County	97.542 (156.977)	98.614 (158.704)	229.10 (207.84)	5.64 (5.12)	35.59 (32.29)	29.68 (26.93)	231.6 (210.1)	5.7 (5.2)	36.0 (32.7)	30.0 (27.2)	2.5 (2.3)/ 1.1%	0.1 (0.01)/ 1.1%	0.4 (0.4)/ 1.1%	0.3 (0.3)/ 1.1%
Statewide (on-road mobile only)	1,109.510 (1,785.583)	1,099.637 (1,769.694)	2,769.19 (2,512.17)	64.71 (58.70)	444.81 (403.52)	366.34 (332.30)	2,795.2 (2536.0)	65.3 (59.2)	449.0 (407.3)	369.7 (335.4)	26.0 23.6/ 1.1%	.6 (.5)/ 1.1%	4.2 (3.8)/ 1.1%	3.4 (3.1)/ 1.1%

Table 3.3-5
Airplane Pollutant Burdens—No Project and Modal Alternatives

Air Basin	2020 Planes No Project Alternative in Tons (Metric Tons)/Day				2020 Burden per Flight in Tons (Metric Tons)/Day*				Number of Additional Planes for Modal Alternative	2020 Additional Burden Modal Alternative in Tons (Metric Tons)/Day				2020 Total Plane Burden Modal Alternative in Tons (Metric Tons)/Day			
	CO	PM10	NO_x	TOG	CO	PM10	NO_x	TOG		CO	PM10	NO_x	TOG	CO	PM10	NO_x	TOG
Sacramento Valley	19.35 (17.55)	0.16 (0.15)	2.45 (2.22)	2.50 (2.27)	0.024 (0.022)	.0001 (.00009)	.008 (.007)	.001 (.0009)	0	0.0	0.0	0.0	0.0	19.35 (17.55)	0.16 (0.15)	2.45 (2.22)	2.50 (2.27)
San Francisco Bay Area	57.11 (51.81)	2.35 (2.13)	24.14 (21.90)	13.05 (11.84)	0.024 (0.022)	.0001 (.00009)	.008 (.007)	.001 (.0009)	0	0.0	0.0	0.0	0.0	57.11 (51.81)	2.35 (2.13)	24.14 (21.90)	13.05 (11.84)
San Joaquin	77.00 (69.85)	0.45 (0.41)	4.30 (3.90)	15.96 (14.48)	0.024 (0.022)	.0001 (.00009)	.008 (.007)	.001 (.0009)	0	0.0	0.0	0.0	0.0	77.00 (69.85)	0.45 (0.41)	4.30 (3.90)	15.96 (14.48)
Mojave Desert	22.71 (20.60)	3.01 (2.73)	3.29 (2.98)	5.49 (4.98)	0.024 (0.022)	.0001 (.00009)	.008 (.007)	.001 (.0009)	0	0.0	0.0	0.0	0.0	22.71 (20.60)	3.01 (2.73)	3.29 (2.98)	5.49 (4.98)
South Coast	68.79 (62.41)	0.50 (0.45)	26.97 24.47)	9.04 (8.20)	0.024 (0.022)	.0001 (.00009)	.008 (.007)	.001 (.0009)	0	0.0	0.0	0.0	0.0	68.79 (62.41)	0.50 (0.45)	26.97 (24.47)	9.04 (8.20)
San Diego County	19.65 (17.83)	1.69 (1.53)	8.42 (7.64)	3.81 (3.46)	0.024 (0.022)	.0001 (.00009)	.008 (.007)	.001 (.0009)	0	0.0	0.0	0.0	0.0	19.65 (17.83)	1.69 (1.53)	8.42 (7.64)	3.81 (3.46)
Statewide (on-road mobile only)	312.89 (283.85)	8.80 (7.98)	73.27 (66.47)	56.17 (50.96)	0.024 (0.022)	.0001 (.00009)	.008 (.007)	.001 (.0009)	0	0.0	0.0	0.0	0.0	312.89 (283.85)	8.80 (7.98)	73.27 (66.47)	56.17 (50.96)

* Flight emissions from FAA EDMS model. Flight emission information is for default 737 and associated ground support.

No Project Alternative Compared to High-Speed Train Alternative (Sensitivity Analysis Variations in Ridership Forecast)
The proposed HST Alternative (with sensitivity analysis forecasts) would have the capacity to accommodate an estimated 68 million annual trips that would otherwise use roadways and airports statewide. The highway component is based on potential VMT reductions resulting from 42.7 million annual trips. The air travel component is based on potential reductions from 25.3 million trips.

Roadways: The proposed HST Alternative could potentially take the place of a 42.7 million city-to-city annual trips using on-road mobile sources and would therefore potentially reduce VMT on the state highway system compared to the No Project and Modal Alternatives. Changes in VMT and estimated on-road mobile source emission reductions resulting from the use of the proposed HST have been calculated for each of the five air basins (Table 3.3-6). The highest on-road mobile source emission reductions are predicted for the San Joaquin Valley Air Basin. The HST Alternative is predicted to reduce the 2020 CARB CO mobile source emission budget for San Joaquin Valley Air Basin by about 3.3% or 11.1 tons (10.1 metric tons). The South Coast Air Basin would receive the next highest potential pollutant reductions (on-road mobile source only), followed by the San Francisco Bay Area, San Diego County, Sacramento Valley, and Mojave Desert Air Basins.

Air Travel: The air-travel component is based on 25.3 million trips (1 trip = 1 takeoff and 1 landing) being shifted from the airplane component of No Project future conditions to the proposed HST. The emission burden reductions projected from the reduced number of flights, shown in Table 3.3-7, was calculated by determining the number of flights that could be accommodated by the proposed HST and multiplying that number by the emission estimates of an average flight, as described above in the discussion of methods of evaluating impacts. The emission changes by air basin resulting from the reduced number of flights range from an estimated 17% reduction in NO_x in the Sacramento Valley Air Basin to no change in the Mojave Desert Air Basin. The South Coast Air Basin is projected to have the largest potential reductions, followed by San Francisco Bay Area, San Diego County, Sacramento Valley, and San Joaquin Valley Air Basins. No reductions would be expected in the Mojave Desert Air Basin.

Statewide, an estimated 99% reduction is predicted in the plane portion of the CO_2 budget estimated for the No Project Alternative. This is approximately 37% of the calculated CO_2 budget for the No Project. CO_2 calculations for No Project Alternative reflect only emissions from electrical power stations, planes, and a portion of on-road VMT. For the plane portion of CARB's projected 2020 emission burden budgets, an 8% reduction is predicted in NO_x, a 6% reduction is predicted in CO, a 2% reduction in TOG, and a 1% reduction in PM10.

Train Travel and Electrical Power: Conventional rail service is not predicted to increase under the proposed HST Alternative therefore no change in pollutant burdens is predicted due to train travel.

Additional electrical power would be required to operate the HST system. Because of the nature of electrical power generation and the use of a grid system to distribute electrical power, it is not yet clear which facilities would be supplying power to the HST system. Emission changes from power generation can therefore be predicted on a statewide level only. As shown in Table 3.3-8, CO, PM10, NO_x, and TOG burden levels would be predicted to increase because of the power requirements of the proposed HST Alternative. A 23% increase representing approximately 14 tons (13 metric tons) statewide daily is predicted in the electric utilities portion of the CO 2020 CARB emission burden projection. This increase would represent less than 0.3% of the overall CO budget for the State of California.

Summary of Pollutants by Alternative: Table 3.3-9 summarizes the combined source categories for the existing conditions and No Project, Modal, and HST (with sensitivity analysis forecasts) Alternatives. Compared to the No Project Alternative, the HST Alternative (with sensitivity analysis forecasts) is predicted to decrease the amount of pollutants statewide in all air basins analyzed. Potential air quality benefits range from medium to low. CO_2 levels are also detailed in Table 3.3-9. CO_2 burden levels were estimated based on energy projections developed for each alternative.

Local Impacts: A total of 508 local screenline locations were analyzed. The general trend in screenline data shows that the level of service in the vicinity of proposed HST station locations would degrade under the HST Alternative. Capacity improvements under the Modal Alternative would generally prevent degradation in level of service at the proposed station sites, but V/C ratios would increase slightly. A V/C ratio is the comparison of the roadway volume to roadway capacity. A V/C of 1.0 would indicate a roadway at capacity. As the alternatives are refined and more in-depth studies are undertaken in future analyses, intersections near proposed HST station locations and any location where volumes would likely increase and V/C ratios degrade should be screened to determine if more detailed local analyses should be conducted to insure that the project does not cause a violation of the ambient air quality standards.

Table 3.3-6
On-Road Mobile Source Regional Emissions Analysis—No Project Alternative and HST Sensitivity Analysis Alternative

	No Project VMT (Km) 2020 (in millions)	HST Sensitivity Analysis Alt. VMT (Km) 2020 (in millions)	No Project Emission Burden in Tons (Metric Tons)/Day				HST Sensitivity Analysis Alternative Emission Burdenin Tons (Metric Tons)/Day				Incremental Change from No Project in Tons (Metric Tons)/Day and % Reduction from No Project			
Air Basin			**CO**	**PM10**	**NO_x**	**TOG**	**CO**	**PM10**	**NO_x**	**TOG**	**CO**	**PM10**	**NO_x**	**TOG**
Sacramento Valley	84.079 (135.312)	83.832 (134.914)	203.67 (184.77)	4.63 (4.20)	31.57 (28.64)	28.33 (25.70)	203.07 (184.222)	4.61 (4.18)	31.47 (28.55)	28.24 (25.62)	0.598 (0.542)/ 0.29%	0.014 (0.013))/ 0.29%	0.093 (0.084)/ 0.29%	0.083 (0.075)/ 0.29%
San Francisco Bay Area	213.901 (344.240)	212.734 (342.362)	493.23 (447.45)	10.46 (9.49)	89.55 (81.24)	68.17 (61.84)	490.54 (445.01)	10.41 (9.44)	89.06 (80.79)	67.80 (61.51)	2.691 (2.441)/ 0.55%	0.057 (0.052)/ 0.55%	0.489 (0.444)/ 0.55%	0.372 (0.337)/ 0.55%
San Joaquin	135.617 (218.254)	131.132 (211.037)	336.18 (304.98)	9.30 (8.44)	61.59 (55.87)	41.01 (37.20)	325.06 (294.89)	9.0 (8.16)	59.55 (54.02)	39.65 (35.97)	11.12 (10.09)/ 3.3%	0.308 (0.279)/ 3.3%	2.037 (1.848)/ 3.3%	1.356 (1.230)/ 3.3%
Mojave Desert	44.681 (71.907)	44.671 (71.891)	93.55 (84.87)	2.39 (2.17)	12.75 (11.57)	5.49 (4.98)	93.52 (84.84)	2.39 (2.17)	12.75 (11.57)	5.49 (4.98)	0.021 (0.019)/ 0.02%	0.001 (0.001)/ 0.02%	0.003 (0.003)/ 0.02%	0.001 (0.001)/ 0.02%
South Coast	402.116 (647.143)	398.682 (641.617)	1,007.32 (913.83)	24.65 (22.36)	150.30 (136.35)	133.50 (121.10)	998.72 (906.02)	24.44 (22.17)	149.02 (135.19)	132.36 (120.08)	8.603 (7.805)/ 0.85%	0.211 (0.191)/ 0.85%	1.284 (1.165)/ 0.85%	1.140 (1.034)/ 0.85%
San Diego County	97.542 (156.977)	97.013 (156.127)	229.10 (207.84)	5.64 (5.12)	35.59 (32.29)	29.68 (26.93)	227.86 (206.71)	5.61 (5.09)	35.40 (32.11)	29.52 (26.78)	1.243 (1.128)/ 0.54%	0.031 (0.028)/ 0.54%	0.193 (0.175)/ 0.54%	0.161 (0.146)/ 0.54%
Statewide (on-road mobile only)	1,109.510 (1,785.583)	1,088.880 (1,752.382)	2,769.19 (2,512.17)	64.71 (58.70)	444.81 (403.52)	366.34 (332.30)	2,744.91 (2,490.14)	64.09 (58.14)	440.71 (399.81)	363.23 (329.52)	24.28 (22.03)/ 0.88%	0.62 (0.56)/ 0.96%	4.10 (3.72)/ 0.92	3.114 (2.825)/ 0.85%

Table 3.3-7
Airplane Emission Burdens—No Project Alternative and HST Sensitivity Analysis Alternative

	2020 Airplanes—No Project in Tons (Metric Tons)/Day				2020 Emissions Burden per Flight in Tons (Metric Tons)/Day*				Number of Additional Planes for HST Sensitivity Analysis Alternative	2020 Additional Emissions Burden—HST Sensitivity Analysis Alternative in Tons (Metric Tons)/Day				2020 Total Plane Emissions Burden—HST Sensitivity Analysis Alternative in Tons (Metric Tons)/ Day and % Change from No Project			
Air Basin	**CO**	**PM10**	**NO_x**	**TOG**	**CO**	**PM10**	**NO_x**	**TOG**		**CO**	**PM10**	**NO_x**	**TOG**	**CO**	**PM10**	**NO_x**	**TOG**
Sacramento Valley	19.35 (17.55)	0.16 (0.15)	2.45 (2.22)	2.50 (2.27)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	-52	-1.3 (-1.2)	-0.003 (-0.003)	-0.4 (-0.4)	-0.1 (-0.1)	18.1 (16.4)/ -7%	0.2 (0.2)/ -2%	2.0 (1.8)/ -17%	2.4 (2.2)/ -3%
San Francisco Bay Area	57.11 (51.1)	2.35 (2.13)	24.14 (21.90)	13.05 (11.84)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	-297	-7.2 (-6.5)	-0.018 (-0.016)	-2.3 (-2.1)	-0.4 (-0.4)	49.9 (45.3)/ -13%	2.3 (2.1)/ -1%	21.8 (19.8) / -10%	12.7 (11.5) / -3%
San Joaquin	77.00 (69.85)	0.45 (0.41)	4.30 (3.90)	15.96 (14.48)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	-15	-0.4 (-0.4)	-0.001 (-0.0009)	-0.1 (-0.1)	0.0	76.6 (69.5)/ 0%	0.4 (0.4)/ 0%	4.2 (3.8)/ -3%	15.9 (14.4) / 0%
Mojave Desert	22.71 (20.60)	3.01 (2.73)	3.29 (2.98)	5.49 (4.98)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	0	0.0	0.0	0.0	0.0	22.7 (20.6)/ 0%	3.0 (2.7)/ 0%	3.3 (3.0)/ 0%	5.5 (5.0)/ 0%
South Coast	68.79 (20.60)	0.50 (0.45)	26.97 (24.47)	9.04 (8.20)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	-305	-7.4 (-6.7)	-0.018 (-0.016)	-2.4 (-2.2)	-0.4 (-0.4)	61.4 (55.7)/ -11%	0.5 (0.5)/ -4%	24.6 (22.3) / -9%	8.7 (7.9)/ -4%
San Diego County	19.65 (17.83)	1.69 (1.53)	8.42 (7.64)	3.81 (3.46)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	-102	-2.5 (-2.3)	-0.006 (-0.005)	-0.8 (-0.7)	-0.1 (-0.1)	17.2 (15.6)/ -13%	1.7 (1.5)/ 0%	7.6 (6.9)/ -9%	3.7 (3.4)/ -3%
Statewide (on-road mobile only)	312.89 (283.85)	8.80 (7.98)	73.27 (66.47)	56.17 (50.96)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	-771	-18.5 (-16.8)	-0.046 (-0.042)	-6.0 (-5.4)	-1.0 (-0.9)	294.4 (267.1) / -6%	8.8 (8.0)/ -1%	67.3 (61.1) / -8%	55.2 (50.1) / -2%

Table 3.3-8
Electrical Power Station Emissions—No Project Alternative and HST Sensitivity Analysis Alternative

	No Project Emission Burden—Electric in Tons (Metric Tons)/Day				HST Sensitivity Analysis Alternative Emission Burden—Electric in Tons (Metric Tons)/Day				Incremental Change from No Project in Tons (Metric Tons)/Day and % Change from No Project			
Air Basin	CO	PM10	NO_x	TOG	CO	PM10	NO_x	TOG	CO	PM10	NO_x	TOG
Statewide	61.99 (56.24)	6.11 (5.54)	38.33 (34.77)	39.24 (35.60)	75.97 (68.92)	6.13 (5.56)	38.47 (34.90)	40.32 (36.58)	13.98 (12.68)/ 22.55%	0.02 (.02)/ 0.36%	0.14 (.13)/ 0.36%	1.09 (.99)/ 2.77%

Table 3.3-9
Potential Impacts on Air Quality Statewide—Existing, No Project, Modal, and HST Sensitivity Analysis Alternatives

	Sacramento Valley Air Basin	San Francisco Bay Area Air Basin	San Joaquin Valley Air Basin	Mojave Desert Air Basin	South Coast Air Basin	San Diego County Air Basin	Statewide
Existing (2003) on-road mobile, trains, planes, and electrical utilities* emission burdens in tons (metric tons)/day							
CO	931.79 (845.31)	2,186.71 (1,983.75)	1,462.98 (1,327.19)	357.48 (324.30)	4,304.27 (3,904.77)	984.05 (892.72)	11,920.99 (10,814.54)
PM10	4.66 (4.23)	12.49 (11.33)	7.2 (6.5)	5.04 (4.57)	21.41 (19.42)	5.15 (4.67)	64.85 (58.83)
O_3 precursor—NO_x	166.24 (150.81)	368.2 (334.0)	261.70 (237.41)	78.43 (71.15)	685.84 (622.18)	150.04 (136.11)	1,962.04 (1,779.93)
O_3 precursor—TOG	107.42 (99.45)	258.0 (234.05)	160.76 (145.84)	40.58 (36.81)	481.44 (436.76)	107.43 (97.46)	1,353.08 (1,227.49)
No project on-road mobile, trains, planes, and electrical utilities* emission burdens in tons (metric tons)/day							
CO	225.01 (204.13)	551.70 (500.49)	415.67 (377.09)	122.88 (111.47)	1,080.59 (980.29)	248.94 (225.83)	3,164.37 (2,870.67)
PM10	5.14 (4.66)	13.03 (11.82)	10.09 (9.15)	6.08 (5.52)	25.70 (23.31)	7.38 (6.70)	82.38 (74.74)
O_3 precursor—NO_x	43.84 (39.77)	119.72 (108.61)	75.99 (68.94)	34.67 (31.45)	186.55 (169.23)	45.11 (40.92)	624.92 (566.92)
O_3 precursor—TOG	31.45 (28.53)	81.65 (74.07)	57.76 (52.40)	13.14 (11.92)	144.01 (130.64)	33.55 (30.44)	468.28 (424.82)
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	1,438,816.9 (1,305,272.7)
Modal Alternative (2020) burden in tons (metric tons)/day and % change in CO, PM10, NO_x, TOG, CO_2 emission burdens compared to No Project							
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	1,438,816.9 (1,305,272.74)
PM10	5.19 (4.71)/ 0.99%	13.15 (11.93)/ 0.88%	10.19 (9.24)/ 1.01%	6.10 (5.53)/ 0.43%	25.97 (23.56)/ 1.06%	7.44 (6.75)/ 0.84%	83.00 (75.30)/ 0.76%
O_3 precursor—NO_x	44.18 (40.08)/ 0.79%	120.71 (109.51)/ 0.82%	76.67 (69.55)/ 0.89%	34.81 (31.58)/ 0.40%	188.20 (170.73)/ 0.89%	45.50 (41.28)/ 0.87%	629.11 (570.72)/ 0.67%
O_3 precursor—TOG	31.76 (28.81)/ 0.99%	82.40 (74.75)/ 0.92%	58.21 (52.81)/ 0.78%	13.20 (11.97)/ 0.46%	145.48 (131.98)/ 1.02%	33.88 (30.74)/ 0.97%	471.65 (427.87)/ 0.72%
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	1,439,163.08 (1,305,586.78)/ 0.00%
Potential Modal Impacts*							
CO	Medium -	Medium -	Medium -	Medium -	Medium -	Medium -	Medium -
PM10	Low -	Low -	Low -	Low -	Medium -	Low -	Low -
NO_x	Medium -	Medium -	Medium -	Medium -	Medium -	Medium -	Medium -

	Sacramento Valley Air Basin	San Francisco Bay Area Air Basin	San Joaquin Valley Air Basin	Mojave Desert Air Basin	South Coast Air Basin	San Diego County Air Basin	Statewide
TOG	Medium -	Medium -	Medium -	Low -	Medium -	Medium -	Medium -
PM10	Low -	Low -	Low -	Low -	Medium -	Low -	Low -
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	Low -
HST Alternative (2020) burden in tons (metric tons) and % change in CO, PM10, NO_x, TOG, CO_2 emission burdens compared to No Project							
CO	223.15 (202.44)/ -0.83%	541.79 (491.50)/ -1.80%	404.18 (366.67)/ -2.76%	122.86 (111.46)/ -0.02%	1,064.58 (965.77)/ -1.48%	245.22 (222.46)/ -1.50%	3,135.33 (2,844.32)/ -0.92%
PM10	5.13 (4.65)/ -0.32%	12.96 (11.76)/ -0.57%	9.78 (8.87)/ -3.06%	6.08 (5.52)/ -0.00%	25.47 (23.11)/ -0.89%	7.34 (6.66)/ -0.50%	81.73 (74.14)/ -0.78%
O_3 precursor—NO_x	43.34 (39.32)/ -1.13%	116.92 (106.07)/ -2.34%	73.84 (66.99)/ -2.83%	34.67 (31.45)/ -0.01%	182.89 (165.92)/ -1.96%	44.12 (40.02)/ -2.19%	614.96 (557.88)/ -1.59%
O_3 precursor—TOG	31.30 (28.39)/ -0.47%	80.90 (73.39)/ -0.92%	56.39 (51.16)/ -2.38%	13.14 (11.92)/ -0.00%	142.49 (129.26)/ -1.06%	33.26 (30.17)/ -0.87%	465.27 (422.09)/ -0.64%
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	1,418,265.15 / -1.43%
Potential HST Regional Impacts*							
CO	Medium +	Medium +	Medium +	Low +	Medium +	Medium +	Medium +
PM10	Low +	Low +	Low +	Low +	Low +	Low +	Low +
NO_x	Medium +	Medium +	Medium +	Low +	Medium +	Medium +	Medium +
TOG	Medium +	Medium +	Medium +	Low +	Medium +	Medium +	Medium +
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	Low +

Notes:

Potential impacts determined using threshold levels and attainment status detailed in Section 3.3.1.

+ = Benefit to air quality.

- = Deterioration in air quality.

N/A = Not Applicable.

CO_2 is analyzed only on a statewide level.

* Emission burdens from electrical utilities are included only in the statewide totals. CO_2 burdens do not include train emissions.

No Project Alternative Compared to High-Speed Train Alternative (Investment-Grade Ridership Forecasts)
The proposed HST Alternative, using investment-grade ridership forecasts, would potentially accommodate an estimated 42 million annual trips, which would otherwise use roadways and airports statewide. The highway component is based on potential VMT reductions from 26.6 million annual trips. The air-travel component is based on 15.4 million trips.

Roadways: The proposed HST Alternative (using investment-grade ridership forecasts) would accommodate city-to-city trips, reducing VMT on the state highway system compared to the No Project and Modal Alternatives. Changes in VMT and on-road mobile source emission burdens have been calculated for each potentially affected air basin (Table 3.3-10) resulting from the estimated 26.6 million vehicle trips that would use the proposed HST Alternative. The highest on-road mobile source emission burden reductions are projected for the San Joaquin Valley Air Basin. The proposed HST system is predicted to reduce the 2020 CARB CO mobile source emissions for the San Joaquin Valley Air Basin by approximately 1.6% or 5.4 tons (4.9 metric tons) daily. The South Coast Air Basin would have the next highest predicted pollutant burden reductions (on-road mobile source only), followed by the San Francisco Bay Area, San Diego County, Sacramento Valley, and Mojave Desert Air Basins.

Air Travel: The HST Alternative would replace city-to-city trips using off-road mobile (air) travel modes. The air-travel component is based on 15.4 million trips (1 trip = 1 takeoff and 1 landing) from the airplane component of No Project conditions. The emissions projected to be saved from the reduced flights, shown in Table 3.3-11, were calculated by determining the number of flights that could be reduced by the proposed HST and multiplying that number by the emission estimates for an average flight, as described above in the discussion of methods of evaluating impacts. The emission burdens by air basin calculated for the reduced flights would range from a 10% reduction in NO_x for the Sacramento Valley Air Basin to no change in the Mojave Desert Air Basin. The South Coast Air Basin is projected to have the largest burden reductions, followed by San Francisco Bay Area, San Diego County, Sacramento Valley, and San Joaquin Valley Air Basins. No reductions would be expected in the Mojave Desert Air Basin.

Statewide, a 60% reduction is projected in the plane portion of the CO_2 budget estimated for No Project. This reduction would be approximately 23% of the calculated CO_2 budget for the No Project Alternative. CO_2 calculations for the No Project Alternative reflect only emissions from electrical power stations, planes, and a portion of on-road VMT. For the plane portion of CARB's projected 2020 emission budgets, a 5% reduction is projected in NO_x; a 4% reduction is predicted in CO; a 1% reduction in TOG; and a reduction of less than 1% in PM10.

Train Travel and Electrical Power: Conventional rail service is not predicted to increase under the proposed HST Alternative.

Additional electrical power would be required to operate the proposed HST system. Because of the nature of electrical power generation and the use of a grid system to distribute electrical power, it is not yet clear which facilities would be supplying power to the proposed HST system. Emission changes from power generation can therefore be predicted on a statewide level only. As shown in Table 3.3-12, CO, PM10, NO_x, and TOG burden levels are predicted to increase statewide because of the power requirements of the HST. A 23% increase in emissions representing approximately 12 tons (11 metric tons) daily is predicted in the electric utilities portion of the CO 2020 CARB emission projection. This increase would represent less than 0.3% of the overall CO budget for the State of California.

Summary of Pollutants by Alternatives: Table 3.3-13 summarizes the combined source categories for existing conditions and the No Project, Modal, and HST Alternatives. Compared to the No Project Alternative, the proposed HST Alternative (with investment-grade ridership forecasts) is projected to result in a decrease in the amount of pollutants statewide and in all air basins analyzed. Potential air quality benefits would range from a medium to a low rating.

Local Impacts: A total of 508 local screenline locations were analyzed. The general trend in screenline data shows that the level of service in the vicinity of proposed HST station locations would degrade under the HST Alternative. Capacity improvements under the Modal Alternative would generally prevent degradation in level of service at the proposed station sites, but V/C ratios would increase slightly. As the alternatives are refined and more in-depth studies are undertaken in future analyses, intersections near proposed HST station locations and any location where volumes would likely increase and V/C ratios degrade should be screened to determine if more detailed local analyses should be conducted to insure that the project does not cause a violation of the ambient air quality standards.

Table 3.3-10
On-Road Mobile Source Emission Regional Analysis—No Project Alternative and HST Investment-Grade Ridership Forecast Alternative

Air Basin	No Project VMT (Km) 2020 (in millions)	HST Investment-Grade Ridership Forecast Alt. VMT (Km) 2020 (in millions)	No Project Emission Burden in Tons (Metric Tons)/Day				HST Investment-Grade Ridership Forecast Alternative Emission Burden in Tons (Metric Tons)/Day				Incremental Change from No Project in Tons (Metric Tons)/Day and % Reduction from No Project			
			CO	PM10	NO_x	TOG	CO	PM10	NO_x	TOG	CO	PM10	NO_x	TOG
Sacramento Valley	84.079 (135.312)	83.948 (135.101)	203.67 (184.77)	4.63 (4.20)	31.57 (28.64)	28.33 (25.70)	203.35 (184.48)	4.62 (4.19)	31.52 (28.59)	28.28 (25.66)	0.316 (0.287)/ 0.2%	0.007 (0.006) / 0.2%	0.049 (0.044)/ 0.2%	0.044 (0.040)/ 0.2%
San Francisco Bay Area	213.901 (344.240)	213.215 (343.136)	493.23 (447.45)	10.46 (9.49)	89.55 (81.24)	68.17 (61.84)	491.65 (446.02)	10.43 (9.46)	90.53 (82.13)	67.95 (61.64)	1.583 (1.436)/ 0.3%	0.034 (0.031) / 0.3%	0.287 (0.260)/ 0.3%	0.219 (0.199)/ 0.3%
San Joaquin Valley	135.617 (218.254)	133.449 (214.765)	336.18 (304.98)	9.30 (8.44)	61.59 (55.87)	41.01 (37.20)	330.81 (300.11)	9.16 (8.31)	62.27 (56.49)	40.35 (36.60)	5.375 (4.876)/ 1.6%	0.149 (0.135) / 1.6%	0.985 (0.894)/ 1.6%	0.656 (0.595)/ 1.6%
Mojave Desert	44.681 (71.907)	44.673 (71.894)	93.55 (84.87)	2.39 (2.17)	12.75 (11.57)	5.49 (4.98)	93.53 (84.85)	2.39 (2.17)	12.89 (11.69)	5.49 (4.98)	0.017 (0.015)/ 0.0%	0.000/ 0.0%	0.002 (0.002)/ 0.0%	0.001 (0.001)/ 0.0%
South Coast	402.116 (647.143)	399.899 (643.575)	1,007.32 (913.83)	24.65 (22.36)	150.30 (136.35)	133.50 (121.10)	1,001.76 (908.78)	24.52 (22.23)	151.96 (137.86)	132.77 (120.45)	5.554 (5.039)/ 0.6%	0.136 (0.123) / 0.6%	0.829 (0.752)/ 0.6%	0.736 (0.668)/ 0.6%
San Diego County	97.542 (156.977)	97.279 (156.555)	229.10 (207.84)	5.64 (5.12)	35.59 (32.29)	29.68 (26.93)	228.48 (207.27)	5.63 (5.11)	35.98 (32.64)	29.60 (26.85)	0.618 (0.561)/ 0.3%	0.015 (0.014) / 0.3%	0.096 (0.087)/ 0.3%	0.080 (0.073)/ 0.3%
Statewide (on-road mobile only)	1,109.510 (1,785.583)	1,104.036 (1,776.774)	2,769.19 (2,512.17)	64.71 (58.70)	444.81 (403.52)	366.34 (332.30)	2,755.52 (2,499.77)	64.37 (58.40)	449.70 (407.96)	364.61 (330.77)	13.46 (12.21)/ 0.5%	0.34 (0.31)/ 0.5%	2.25 (2.04)/ 0.5%	1.74 (1.59)/ 0.5%

Table 3.3-11
Airplane Emission Burdens—No Project Alternative and HST Investment-Grade Ridership Forecast Alternative

	2020 Planes—No Project in Tons (Metric Tons)/Day				2020 Emission Burden per Flight in Tons (Metric Tons)/Day*				# of Planes Removed by HST Investment-Grade Ridership Forecast Alt.	2020 Additional Emission Burden—HST Investment-Grade Ridership Forecast Alternative in Tons (Metric Tons)/Day				2020 Total Plane Emissions Burden—HST Investment-Grade Ridership Forecast Alternative in Tons (Metric Tons)/Day and % Change from No Project			
Air Basin	**CO**	**PM10**	**NO_x**	**TOG**	**CO**	**PM10**	**NO_x**	**TOG**		**CO**	**PM10**	**NO_x**	**TOG**	**CO**	**PM10**	**NO_x**	**TOG**
Sacramento Valley	19.35 (17.55)	0.16 (0.15)	2.45 (2.22)	2.50 (2.27)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	31	-0.75 (-0.68)	-0.002 (-0.002)	-0.241 (-0.219)	-0.039 (-0.035)	18.594 (16.868)/ -4%	0.160 (0.145)/ -1.%	2.205 (2.000)/ -10%	2.463 (2.234)/ -2%
San Francisco Bay Area	57.11 (51.1)	2.35 (2.13)	24.14 (21.90)	13.05 (11.84)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	181	-4.4 (-4.0)	-0.011 (-0.010)	-1.408 (-1.277)	-0.230 (-0.209)	52.711 (47.819)/ -8%	2.338 (2.121)/ 0%	22.735 (20.625)/ -6%	12.818 (11.628)/ -2%
San Joaquin Valley	77.00 (69.85)	0.45 (0.41)	4.30 (3.90)	15.96 (14.48)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	9	-0.219 (-0.199)	-0.001 (-0.001)	-0.070 (-0.064)	-0.011 (-0.010)	76.777 (69.651)/ 0%	0.446 (0.405)/ 0%	4.225 (3.833)/ -2%	15.95 (14.47)/ 0%
Mojave Desert	22.71 (20.60)	3.01 (2.73)	3.29 (2.98)	5.49 (4.98)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	0	0.00	0.00	0.00	0.00	22.713 (20.605)/ 0%	3.010 (2.731)/ 0%	3.290 (2.985)/ 0%	5.490 (4.980)/ 0%
South Coast	68.79 (20.60)	0.50 (0.45)	26.97 (24.47)	9.04 (8.20)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	186	-4.522 (-4.102)	-0.011 (-0.010)	-1.447 (-1.313)	-0.236 (-0.214)	64.269 (58.304)/ -7%	0.492 (0.446)/ -2%	25.526 (23.157)/ -5%	8.803 (7.986)/ -3%
San Diego County	19.65 (17.83)	1.69 (1.53)	8.42 (7.64)	3.81 (3.46)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	62	-1.507 (-1.367)	-0.004 (-0.004)	-0.482 (-0.437)	-0.079 (-0.072)	18.147 (16.463)/ -8%	1.688 (1.531)/ 0%	7.936 (7.199)/ -6%	3.727 (3.381)/ -2%
Statewide (on-road mobile only)	312.89 (283.85)	8.80 (7.98)	73.27 (66.47)	56.17 (50.96)	0.024 (0.022)	.0001 (.0001)	.008 (.007)	.001 (.0009)	469	-11.40 (-10.34)	-0.028 (-0.025)	-3.649 (-3.310)	-0.596 (-0.541)	301.48 (273.50)/ -4%	8.772 (7.958)/ -0%	69.624 (63.162)/ -5%	55.57 (50.41)/ -1%

Table 3.3-12
Electrical Power—No Project Alternative and HST Investment-Grade Ridership Forecast Alternative

	No Project Emission Burden—Electric in Tons (Metric Tons)/Day				HST Investment-Grade Ridership Forecast Alternative Emission Burden—Electric in Tons (Metric Tons)/Day				Incremental Change from No Project in Tons (Metric Tons)/Day/Percent Change from No Project			
Air Basin	**CO**	**PM10**	**NO_x**	**TOG**	**CO**	**PM10**	**NO_x**	**TOG**	**CO**	**PM10**	**NO_x**	**TOG**
Statewide	61.99 (56.24)	6.11 (5.54)	38.33 (34.77)	39.24 (35.60)	73.87 (67.01)	6.12 (5.55)	38.45 (34.88)	40.16 (36.43)	11.88 (10.78)/ 19%	0.02 (0.02)/ 0.36%	0.14 (0.13)/ 0.36%	1.09 (0.99)/ 2.77%

Table 3.3-13
Potential Impacts on Air Quality Statewide—Existing, No Project, Modal, and HST Investment-Grade Ridership Alternatives

	Sacramento Valley Air Basin	San Francisco Bay Area Air Basin	San Joaquin Valley Air Basin	Mojave Desert Air Basin	South Coast Air Basin	San Diego Air Basin	Statewide
Existing (2003) on-road mobile, trains, planes, and electrical utilities* emission burdens in tons (metric tons)/day							
CO	931.79 (845.31)	2,186.71 (1,983.75)	1,462.98 (1,327.19)	357.48 (324.30)	4,304.27 (3,904.77)	984.05 (892.72)	11,920.99 (10,814.54)
PM10	4.66 (4.23)	12.49 (11.33)	7.2 (6.5)	5.04 (4.57)	21.41 (19.42)	5.15 (4.67)	64.85 (58.83)
O_3 precursor—NO_x	166.24 (150.81)	368.2 (334.0)	261.70 (237.41)	78.43 (71.15)	685.84 (622.18)	150.04 (136.11)	1,962.04 (1,779.93)
O_3 precursor—TOG	107.42 (99.45)	258.0 (234.05)	160.76 (145.84)	40.58 (36.81)	481.44 (436.76)	107.43 (97.46)	1,353.08 (1,227.49)
No Project (2020) on-road mobile, trains, planes, and electrical utilities* emission burdens in tons (metric tons)/day							
CO	225.01 (204.13)	551.70 (500.49)	415.67 (377.09)	122.88 (111.47)	1,080.59 (980.29)	248.94 (225.83)	3,164.37 (2,870.67)
PM10	5.14 (4.66)	13.03 (11.82)	10.09 (9.15)	6.08 (5.52)	25.70 (23.31)	7.38 (6.70)	82.38 (74.74)
O_3 precursor—NO_x	43.84 (39.77)	119.72 (108.61)	75.99 (68.94)	34.67 (31.45)	186.55 (169.23)	45.11 (40.92)	624.92 (566.92)
O_3 precursor—TOG	31.45 (28.53)	81.65 (74.07)	57.76 (52.40)	13.14 (11.92)	144.01 (130.64)	33.55 (30.44)	468.28 (424.82)
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	1,438,816.9 (1,305,272.7)
Modal Alternative (2020) burden in tons (metric tons)/day and % change in CO, PM10, NO_x, TOG, CO_2 emission burdens compared to No Project							
CO	227.25 (206.16)/ 1.00%	557.13 (505.42)/ 0.98%	419.37 (380.45)/ 0.89%	123.91 (112.41)/ 0.84%	1,091.67 (990.35)/ 1.03%	251.46 (228.12)/ 1.01%	3,190.37 (2,894.25)/ 0.82%
PM10	5.19 (4.71)/ 0.99%	13.15 (11.93)/ 0.88%	10.19 (9.24)/ 1.01%	6.10 (5.53)/ 0.43%	25.97 (23.56)/ 1.06%	7.44 (6.75)/ 0.84%	83.00 (75.30)/ 0.76%
O_3 precursor—NO_x	44.18 (40.08)/ 0.79%	120.71 (109.51)/ 0.82%	76.67 (69.55)/ 0.89%	34.81 (31.58)/ 0.40%	188.20 (170.73)/ 0.89%	45.50 (41.28)/ 0.87%	629.11 (570.72)/ 0.67%
O_3 precursor—TOG	31.76 (28.81)/ 0.99%	82.40 (74.75)/ 0.92%	58.21 (52.81)/ 0.78%	13.20 (11.97)/ 0.46%	145.48 (131.98)/ 1.02%	33.88 (30.74)/ 0.97%	471.65 (427.87)/ 0.72%
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	1,439,163.08 (1,305,586.78)/ 0.00%
Potential Modal Impacts*							
CO	Medium -	Medium -	Medium -	Medium -	Medium -	Medium -	Medium -
PM10	Low -	Low -	Low -	Low -	Medium -	Low -	Low -
NO_x	Medium -	Medium -	Medium -	Medium -	Medium -	Medium -	Medium -

	Sacramento Valley Air Basin	San Francisco Bay Area Air Basin	San Joaquin Valley Air Basin	Mojave Desert Air Basin	South Coast Air Basin	San Diego Air Basin	Statewide
TOG	Medium -	Medium -	Medium -	Low -	Medium -	Medium -	Medium -
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	Low -
HST Alternative (2020) burden in tons (metric tons)/day and % change in CO, PM10, NO_x, TOG, CO_2 emission burdens compared to No Project							
CO	223.94 (203.15)/ -0.48%	545.72 (495.07)/ -1.08%	410.07 (372.01)/ -1.35%	122.86 (111.46)/ -0.01%	1,070.52 (971.16)/ -0.93%	246.81 (223.90)/ -0.85%	3,151.39 (2,858.89)/ -0.41%
PM10	5.13 (4.65)/ -0.18%	12.99 (11.78)/ -0.34%	9.94 (9.02)/ -1.48%	6.08 (5.52)/ -0.01%	25.55 (23.18)/ -0.57%	7.36 (6.68)/ -0.26%	82.03 (74.42)/ - 0.43%
O_3 precursor—NO_x	43.55 (39.51)/ -0.66%	118.03 (107.08)/ -1.42%	74.93 (67.98)/ -1.39%	34.67 (31.45)/ -0.01%	184.27 (167.17)/ -1.22%	44.53 (40.40)/ -1.28%	619.13 (561.67)/ -0.93%
O_3 precursor—TOG	31.37 (28.46)/ -0.27%	81.20 (73.66)/ -0.55%	57.09 (51.79)/ -1.15%	13.14 (11.92)/ -0.01%	143.04 (129.76)/ -0.68%	33.40 (30.30)/ -0.47%	466.87 (423.54)/ -0.30%
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	1,432,412.18 (1,299,462.47)/ -0.45%
Potential HST Regional Impacts*							
CO	Medium +	Medium +	Medium +	Low +	Medium +	Medium +	Medium +
PM10	Low +	Low +	Low +	Low +	Low +	Low +	Low +
NO_x	Medium +	Medium +	Medium +	Low +	Medium +	Medium +	Medium +
TOG	Medium +	Medium +	Medium +	Low +	Medium +	Medium +	Medium +
CO_2	N/A	N/A	N/A	N/A	N/A	N/A	Low +

Notes:
Potential Impacts determined using threshold levels and attainment status as detailed in Section 3.3.1.
+ = Benefit to air quality
- = Deterioration in air quality
N/A = Not Applicable
CO_2 is analyzed only on a statewide level.

* Emission burdens from electrical utilities are included only in the statewide totals. CO_2 burdens do not include train emissions.

3.3.4 Mitigation Strategies

The program-level analysis in this document reviews the potential statewide air quality impacts of a proposed HST system and the analysis would support determination of conformity for the proposed HST system. At the project level potential mitigation strategies should be explored to address potential localized impacts. Emissions from power plants supplying power to the proposed HST system could be controlled at those power plants as required under air pollution control permits. The proposed HST system could be designed to use state-of-the-art, energy-efficient equipment to minimize potential air pollution impacts associated with power used by the proposed HST system. Potential localized impacts could be addressed at the project level by promoting the following measures.

- Increase use of public transit.
- Increase use of alternative-fueled vehicles.
- Increase parking for carpools, bicycles, and other alternative transportation methods.

Potential construction impacts, which should be analyzed once more detailed project plans are available, can be mitigated by following local and state guidelines.

3.3.5 Subsequent Analysis

More detail on the impact of the potential changes in vehicle hours traveled (VHT) in the regional analysis should be available for the next phase of the environmental analysis. HST alignment options should also be refined for the next phase of analysis. Once alignments are selected, if a decision is made to proceed with the proposed HST system, then local traffic counts could be conducted at access roads serving major station locations. These counts would provide more accurate information for determining potential local air quality hotspot locations. Hotspots are areas where the potential for elevated pollutant levels exist. Once hotspot locations (if any) are determined, a detailed analysis following the guidelines at the time of analysis should be conducted.

Potential construction impacts and potential mitigation measures should also be addressed in subsequent analyses. Once an alternative and alignment is established a full construction analysis should be conducted. This analysis should quantify emissions from construction vehicles, excavation, worker trips, and other related construction activities. Mitigation measures, if required, should be detailed and a construction monitoring program, if required should be established.